



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Well-being and Its Measurement

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Authors:

Monique Moore, Ph.D.

Mark Bates, Ph.D.

Patricia Brierley-Bowers, Ed.D.

Paul Taaffe, Ph.D.

Roy Clymer, Ph.D., Contractor, DCoE

Acknowledgements:

Kedar Gumaste

Angela Drake, Ph.D.

Jeff Zeldes, M.D.

Jennifer Clark, Ph.D.

Authors' Positions at DCoE:

Monique Moore, Ph.D., Psychologist, Resilience and Prevention Directorate

Mark Bates, Ph.D., Director, Resilience and Prevention Directorate

Patricia Brierley-Bowers, Ed.D., Contractor, DCoE

Paul Taaffe, Ph.D., Contractor, DCoE

Roy Clymer, Ph.D., Contractor, DCoE

Introduction

Well-being is linked to several aspects of health, including the psychological, spiritual, social and physical – all components of force readiness. A simple measure of well-being may be a practical indicator of readiness. This paper will first provide a brief overview of the definition and measurement of well-being with an emphasis on its relevance to military readiness. It will then describe a circumscribed collection of population-based measures of well-being which may be useful to assess family and service member readiness. A set of descriptors including clinical, psychometric and practical factors are utilized to assess each measure. Correlations between these measures of well-being and epidemiological factors are discussed. Limits to existing measures are addressed and future directions are offered for consideration.

Defining Well-being

Although the discussion about what constitutes well-being goes back to antiquity, the attempt to measure it is relatively recent. Historically, the philosophical concern was to identify and prescribe the essentials of a good or well-lived life. Pleasure, responsibility, self-knowledge and love of others were variously advanced as central to attaining a high quality of life. Notably absent in these philosophical answers was any consideration of mankind's material condition. With the scientific revolution came the attempt to measure well-being, especially in the disciplines of economics, sociology and medicine. An important focus of economics is the assessment of standard of living, primarily indicated by levels of income. Sociological thought led to the inclusion of other objective considerations such as crime rates, educational attainment and social connectedness. Ultimately, medicine and psychology pioneered an entirely different approach – the measurement of subjective well-being (SWB).

That the common concern of mankind is the pursuit of happiness is codified in the Declaration of Independence. The measurement of SWB is the scientific attempt to capture the human experience of varying degrees of happiness. The fact that people experience an ever-changing mix of pleasant and aversive emotions, are isolated or connected to others, in more or less pain, judge life to be going well or not. The attempt to measure SWB puts the focus on people's own assessment of their lives, how they feel and think about their life experience.

SWB is seen as a component of the more general concept of quality of life (QOL).¹ When assessing the quality of people's lives, one can consider objective conditions such as their state of health or economic circumstances. But, as it has come to be seen, equally relevant are people's subjective perceptions about these objective realities. For a given state of health or annual income, for example, people can hold widely diverging views on how they feel about their situation. These views are inherently subjective, known only to the person and can only be determined through self-report.

The inherent subjectivity of well-being makes defining it difficult. Is the experience of living a good life primarily a matter of feeling or emotion? Is it a preponderance of positive or pleasant feelings over unpleasant ones? Is happiness a matter of pursuing that which is pleasurable? There is a long tradition of defining and measuring quality of life from that point of view, called the hedonic tradition. Attempts at measuring SWB that come from this tradition focus on asking people about their feelings over some various time intervals.² An alternative view is that well-being comes from pursuing not simply pleasurable feelings but from a life guided by a pursuit of some purpose or meaning. The eudemonic tradition attempts to measure SWB from this frame of reference to try to discern how people find meaning and fulfillment in life. Each approach emphasizes the affective or cognitive appraisals that people make of events. Although apparently separate, they are inherently interrelated as how people feel in a situation that affects what they think about it and how they think about

something affects how they feel. Individual measures of SWB may focus on one of these two components or a combination of the two.

The concept of well-being implies more than the mere absence of negatives in one's life. It is intended to imply a positive, well-lived, thriving life. The Center for Disease Control notes well-being to include the following: (www.cdc.gov/hrqol/wellbeing.htm):

- Physical well-being
- Economic well-being
- Social well-being
- [Personal] development and activity
- Emotional well-being
- Psychological well-being
- Life satisfaction
- Domain specific satisfaction
- Engaging activities and work

The personal value of a high SWB has clear benefits. Those reporting high SWB are less vulnerable to infection,³ heal more quickly,⁴ make less cortisol,⁵ smile more frequently, report better sleep quality, are less likely to attempt suicide in the future and less likely to become depressed.² These correlates suggest that efforts to identify modifiable factors influencing well-being may result in substantial improvement to people's lives.

The Benefits of Measuring Well-being

The benefits of measuring well-being can be identified by tracing the use of SWB measures over the span of their usage from the global to the particular, from the international level to the individual. Several international efforts exist to track SWB across time, nations and cultures. Examples include the World Health Organization-Quality of Life survey (WHO-QOL), the World Values Survey and the International Wellbeing Group. By using a common measurement instrument, data from these surveys can be used to ascertain the basis for differences between SWB across nations. Researchers can see the effects of differing political, economic, health care and social welfare systems, for example, on SWB.

Measuring SWB has also proven useful at the national level. The Australian Unity Wellbeing Index has been gathering semi-annual data on Australian SWB since 2001. In the United States, the Gallup-Healthways Well-Being Index has been gathering daily data on 1,000 individuals since 2008. These and other national surveys provide information on the effect of significant national events (e.g., terrorist acts, economic conditions) on SWB. When the measures gather relevant demographic data, (e.g., income level, marital status), they provide a great deal of the information about the correlates and consequences of well-being.

At the institutional level, local governments,⁶ the Department of Health and Human Services⁷ and private corporations⁸ (e.g., IBM) have come to realize that their mission is more readily met by enhancing the well-being of their citizens, service members or employees. Each of these organizations uses or advocates the use of measures of SWB as part of their efforts to reach their institutional goals.

In arguing for the need for a national index of SWB, Ed Diener, research psychologist and nationally recognized well-being research expert, states:

“...some countries are better able to meet people’s basic needs, such as for food, clean water, and health, and these nations evidence higher levels of SWB. Another effect of culture is to alter the correlates of SWB by influencing people’s goals and values. Finally, variations in cultural influences on mean levels of SWB appear to result from variations in optimism and positivity, social support, coping patterns and degree of regulation of individual desires.”²

The many variables described by Diener are seen as critically important to attaining national and institutional goals, and are thought to be modifiable by leadership, that governments and corporations have come to see the promotion and measurement of SWB is essential to establishing a culture of success.

Total Force Fitness and Well-being

Over the years, the physical aspect of fitness has been emphasized within the military.³ Adm. Michael Mullen, former Chairman of the Joint Chiefs of Staff (CJCS), views fitness from a wider lens and sees it as being a much more comprehensive process involving both the mind and the body.⁹ Further, fitness is thought to be “... a point of balance between readiness and well-being, where each of these two conditions are mutually supporting ...”¹

The Total Force Fitness (TFF) for the 21st Century conference was held in December 2009 during Adm. Mullen’s tenure and produced an expanded definition of TFF to include a total of eight domains (i.e., psychological, social, behavioral, spiritual, physical, medical, nutritional and environmental). TFF requires that all the eight domains of mind and body are seamlessly combined and addressed to achieve the highest level of fitness.¹⁰ The most current thought in TFF incorporates a continuum of health from thriving (green-zone), to ill (red-zone), which is achieved through the interaction of all eight domains.¹⁰ Through this model, military leaders can learn to understand and facilitate well-being. It is a framework that can be used to enhance fitness and readiness in service members and families.

In this era of war, service members and families are confronted by a host of challenges that test their inner resources. The psychological domain of the TFF model comprises five sub-domains (i.e., coping, attention and awareness, beliefs/appraisals, decision-making and engagement) that, when functioning at optimal levels, promote resilience and improve performance.¹¹ For example, for service members anticipating combat being cognizant of their anxiety puts them in a position to make use of previously learned coping skills, such as relaxation methods, and to mentally rehearse their responses to various situations. Acknowledging the feeling state of anxiety allows service members to decide in advance how they will act given certain circumstances. Moreover, they have the opportunity to bolster their beliefs about themselves, their units and their leaders as war fighters. By focusing on individual and group strengths, service members demonstrate engagement in the war effort.

While the psychological domain is geared toward the individual service member’s adaptation to the military way of life, the social domain encompasses relationships with the unit, leaders, family and community. Support and cohesion are two important elements of the social domain. The social support element refers to a feeling of fitting in and a sense of belonging. Social cohesion speaks to service members liking and caring for one another, having a bond with loved ones and feeling a connection to society as a whole. Task cohesion has to do with the groups rallying around shared goals.

The behavioral domain of the TFF model addresses substance abuse, weight and sleep problems.¹² There are

enormous financial costs incurred by the Defense Department for the treatment of such issues. A variety of prevention programs are in place for the purpose of averting the deleterious effects of these behavioral fitness matters on service members, units and families.

According to Hufford, Fritts and Rhodes, spirituality may represent the only safe haven for those who wage war.¹³ Spiritual fitness – another of the TFF domains – is composed of several intersecting factors, including positive beliefs. Most service members believe that what they are doing is for a greater good, therefore their sacrifices seem worthwhile and meaningful. The hope is that they will be guided in their actions by morality-based, personal and service-related values. Spiritual fitness also implies that there are ethical leaders who model appropriate behavior and show sensitivity to the spiritual diversity of their respective units.

The adage, “A chain is only as strong as its weakest link,” is, perhaps, most easily understood when referring to the physical domain. Well-being comes from the knowledge that the required level of effort can be maintained over a period of time (i.e., endurance). Similarly, service members’ well-being is increased when they are confident in their abilities to overpower many types of resistance (i.e., strength). Endurance and strength are complemented when service members have range of motion in their movements (i.e., flexibility) and can move freely in space (i.e., mobility).

Medical and environmental fitness are thought to go hand in hand with the former having to do with the overall health of service members and the latter involving the varied contexts in which they do their jobs.¹⁴ A few of the medical and environmental sub-domains ensure that service members have access to state-of-the-art health care, receive necessary immunizations, and are screened for illnesses and injuries before and after deployments. Given that fitness for duty, readiness and well-being rely to a great extent on service members’ medical conditions, it seems self-evident that medical fitness ought to be a top priority. Service members must be able to accommodate to different environments and remain healthy. This holds true for surroundings that push or cross the limits of temperature, altitude, air quality and noise.

Nutritional fitness, like the other TFF domains, has direct bearing on well-being. The underlying premise is that service members who make healthy food choices on a routine basis will enjoy physical, medical, behavioral and psychological fitness.¹⁵ The convergence of these TFF model clinical domains highlights the notion that holistic health is essential to an understanding of well-being.

Adm. Mullen, in the CJCS Guidance for 2011¹⁶ stated, “... health-of-force goes beyond our people—we must restore readiness. Readiness is the ability to provide and integrate capabilities required by combatant commanders to execute their assigned missions.” In order to maintain that readiness, commanders must have a force that has the full capacity to respond immediately and this includes fitness. Adm. Mullen defines fitness which plays a vital role in force readiness in the CJCS Guidance for 2011¹⁶ “...‘Total Force Fitness’ - a methodology for changing the way we understand, assess and maintain our people's well-being and sustaining our ability to carry out our missions.” In this statement Adm. Mullen defines TFF as a model of well-being which has a direct impact on force readiness.

Criteria for Analysis of Measures of Well-being

Delving into the topic of well-being at the theoretical level unavoidably leads to questions about measurement. A high value is placed on distinguishing those well-being measures that best assess the construct and are germane to populations of interest. Typically, population-based measures aggregate data from thousands of representative subjects who complete a measurement tool such as a questionnaire or survey. One of the advantages is that the results are considered to have broad applicability and generalizability (i.e., external validity). To date, the relative merits of 13 population-based, well-being measures were evaluated for possible use in the military with respect to their clinical, psychometric and practical components. Please see Appendix A for a brief description of each measure.

Clinical Components

As described above, well-being may be operationalized for the military as a measure of TFF. Therefore, the domains of TFF were utilized for comparison across the 13 different measures of well-being. The alignment of the measures' subscales and items with the TFF domains are rough estimates based on the descriptions of the subscales and, as such, the correlations have not been formally tested.

For the most stringent of analysis, to consider a TFF domain as being measured by a particular index, a factor analyzed subscale with a coefficient alpha above .70 had to be demonstrated. The measures and their subscales as they align to TFF are found in Appendix B. This meant that a number of surveys may have had questions pertaining to a specific TFF domain but did not meet the threshold for being representative of the entire domain. For the World Values Survey (WVS) and European Social Survey (ESS), evidence of factor-analyzed subscales could not be found, while the Midlife Development in the United States (MIDUS) is a battery of instruments each with different properties. Additionally, some measures did not have factor-analyzed subscales due to their brevity. For example the Flourishing Scale includes items reflective of the TFF social and spiritual domain, and the Personal Wellbeing-Index Adult (PWI-A) has items that aligned with six of the TFF domains (social, spiritual, physical, medical, nutritional and environmental domains). Measures without factor-analyzed subscales are not included in Appendix B.

The alignment of the measures to TFF domains may be further analyzed by considering the frequency that each domain is represented. In this case, rather than considering only factor-analyzed subscales, measures were considered to address a domain if representative items were included.

The number of well-being measures that were found to contain items in each of the TFF domains is illustrated in Table 1.

Table 1: *Frequency of TFF Domains Addressed by Well-being Measures*

Clinical domains	Number of measures addressing each domain
Psychological	8
Social	10
Behavioral	3
Spiritual	11
Physical	8
Medical	7
Nutritional	3
Environmental	6

The suggestion here is that the social, psychological and spiritual domains are more frequently assessed in comparison to the nutritional and behavioral domains as measures of well-being. This does not necessarily mean that nutritional and behavioral factors do not impact well-being, but questions pertaining to those domains may be subsumed under different constructs due to their strong relationship. Therefore, nutritional questions may be found in measures of medical or physical well-being constructs, and behavioral questions may be found in either psychological or medical well-being constructs. Please see Appendix C for each measures subscales and sample items.

Likewise, each well-being measure was found to have items which addressed a number of TFF domains.

Table 2: *TFF Domains Addressed by Each Well-being Measure*

Well-being measures	Number of TFF clinical domains addressed
Australian Unity Wellbeing Index	6
CDC Well-Being Scale Brief	3
European Social Survey	5
Flourishing Scale	2
Gallup-Healthways Well-Being Index	6
Global Assessment Tool (Soldier GAT)	3
Midlife Development in the United States	5
Navy-Marine Corps Quality of Life Questionnaire	3
NHCS General Well-Being Scale	3
Personal Wellbeing Index-Adult	6
Ryff's Scales of Psychological Well-Being	4
WHO Quality of Life	4
World Values Survey	4

The Gallup-Healthways Well-Being Index, PWI-A and Australian Unity Index (which includes the PWI-A) are comprised of items that address six of the eight TFF model clinical domains, while the ESS and the MIDUS each capture five. Conversely, the Flourishing Scale was determined to cover only the spiritual and social domain. The greater number of TFF domains captured by a population-based measure of well-being allows for a clearer assessment of overall fitness and readiness. It also provides a more accurate picture of relative strengths and weaknesses, allowing for discrete interventions to improve unit readiness. Table 3 shows the fit of each population based measure of well-being to the eight domains of TFF.

Table 3: Total Force Fitness Domain Alignment

Well-being Measures	Total Force Fitness Domains							
	Psychological	Social	Behavioral	Spiritual	Physical	Medical	Nutritional	Environmental
Australian Unity Wellbeing Index		✓		✓	✓	✓	✓	✓
CDC Well-Being Scale Brief	✓			✓	✓			
European Social Survey (ESS)	✓	✓		✓	✓	✓		
Flourishing Scale		✓		✓				
Gallup-Healthways Well-Being Index	✓		✓	✓	✓	✓	✓	
Global Assessment Tool (Soldier GAT)	✓	✓		✓				
Midlife Development in the United States (MIDUS)	✓	✓	✓		✓	✓		
Navy-Marine Corps Quality of Life Questionnaire		✓		✓		✓		
NHCS General Well-being Scale			✓	✓	✓			
Personal Wellbeing Index – Adult (PWI-A)		✓		✓	✓	✓	✓	✓
Ryff's Scales of Psychological Well-being	✓	✓		✓				✓
WHO Quality of Life (WHOQOL-BREF)	✓	✓			✓			✓
World Values Survey (WVS)	✓	✓		✓		✓		✓

*Blank cells indicate no evidence identified (i.e., no items found in literature reviewed).

In summary, the Gallup-Healthways Well-being Index, Personal Wellbeing Index-Adult and Australian Unity Index provide the broadest coverage of TFF domains. However, the Gallup-Healthways aligns with the six TFF domains through the most stringent of criteria, factor-analyzed subscales. The PWI-A and Australian Unity Index on the other hand aligns to the TFF domains through only item representation. Therefore, the Gallup-Healthways offers a more robust measure of TFF domains and for a perfect fit, the Gallup-Healthways would need to develop measures of the social and environmental domains.

Psychometric Components

Psychometrics is a branch of psychology that is concerned with measurement. Reliability is a fundamental concept in psychometrics and is concerned with the repeatability of measurements. One form of reliability, internal consistency, is the degree of correlation (i.e., Cronbach's alpha) between items from the same test or subscale in measuring a particular construct. Test-retest reliability is the extent to which multiple administrations of the same instrument produce similar results. The literature review of the 13 population-based measures indicated that nine showed internal consistency and five had test-retest reliability. Further, five (i.e., the Flourishing Scale, NHCS General Well-Being Scale, Personal Well-Being Index-Adult, Ryff's Scales of Psychological Well-Being and WHO-QOL-BREF) had evidence of both kinds of reliability. There was no

mention of either type of reliability with the Australian Unity Wellbeing Index, World Values Survey and the European Social Survey. Please see Appendix D for the reliability statistics for each measure.

Validity is another key concept in the field and describes an instrument's ability to measure what it intends to measure. If a test was used to measure well-being, but was determined to actually measure intelligence, this would be an invalid test of well-being. There are several types of validity, one of which is construct validity. This form of validity quantifies the capacity of a tool to measure the concept it purports to measure. Content validity looks at the degree to which a test covers the construct to be assessed. One could argue the content of a test of well-being must contain a sufficient number of items related to both happiness and satisfaction with life.

The response process is a type of validity that calls for subjects to perform behaviors during administration of the test consistent with the concept under investigation. Predictive validity is the extent to which a behavior or characteristic in examinees can be foreseen based on a current measurement. As an example, this kind of validity is of particular importance with measures of well-being and the likelihood of suicide occurring at a later point in time. Concurrent validity differs from predictive validity as two measurements are taken at or near the same point in time. The correlation is established between a previously validated tool and another. Instruments also can be said to have internal and external validity. Internal validity permits conclusions to be drawn regarding cause-effect relationships (e.g., higher levels of gender equity leading to gains in subjective well-being). External validity allows for generalization of outcome data from a given test sample to a larger population as long as there are similarities in personal, contextual and time variables.

The literature review of the 13 population-based measures referenced above revealed a number of commonalities in the area of validity as depicted in Table 4:

Table 4: *Validity Type and Measures of Well-being*

Type of validity	Number of measures demonstrating each type
Construct	8
Content	10
Response process	3
Predictive	0
Concurrent	4
Internal	7
External	4

*Average = 5.1

It is conceivable that these 13 measures possess one or more additional types of validity, but this was not made explicit in the literature review. Interestingly, the Personal Well-Being Index-Adult was found to have five of seven forms of validity, the Flourishing Scale was noted to have four, and the remainder was cited as having three or fewer. Regrettably, none of the measures was reported to have predictive validity as defined above. Only three of the 13 proved to have external validity, meaning that results of a questionnaire or survey, for example, could be generalized beyond the civilian samples at hand. Table 5 summarizes the measures' psychometric components.

Table 5: Comparative Analysis of Psychometric Components

Well-being Measures	Reliability		Psychometric Validity					
	Test Retest	Internal Consistency	Test Content	Response Process	Construct	Concurrent	Internal	External
Australian Unity Wellbeing Index			✓		✓			
CDC Well-Being Scale Brief		✓				✓		
European Social Survey (ESS)		✓	✓				✓	
Flourishing Scale	✓	✓	✓		✓	✓	✓	
Gallup-Healthways Well-Being Index		✓	✓				✓	✓
Global Assessment Tool (Soldier GAT)		✓	✓	✓	✓			
Midlife Development in the United States (MIDUS)		✓			✓			
Navy-Marine Corps Quality of Life Questionnaire		✓	✓		✓		✓	
NHCS General Well-being Scale	✓	✓	✓			✓		✓
Personal Wellbeing Index – Adult (PWI-A)	✓	✓	✓	✓	✓		✓	✓
Ryff's Scales of Psychological Well-being	✓	✓		✓			✓	✓
WHO Quality of Life (WHOQOL-BREF)	✓	✓	✓		✓		✓	
World Values Survey (WVS)			✓		✓	✓		

*Blank cells indicate no evidence identified in literature reviewed.

Practical Components

Practical components of measures are those that pertain to the administration of the instrument. The components utilized for this analysis include:

- Length – The number of items
- Time to complete – Total average minutes taken to complete the survey
- Standard administration – Consistency of procedures and conditions for administration of the survey
- Format – Paper and pencil, interview or computer-based survey
- Time period – The number of past days for which the respondent is instructed to base his or her response
- Normative data – Sets of information that characterize groups
- Military relevance – Successful and documented use within the military

These practical components determine the usability of the measure across a variety of settings and demographics.

The practical components of each of the measures are illustrated in Table 6.

Table 6: Comparative Analysis of Practical Components

Well-being Measures	Practical						
	Length (items)	Time to Complete (min)	Standard Administration	Format*	Time Period (past days)	Normative Data	Military Relevance
Australian Unity Wellbeing Index	22	10	✓	I,P	1	✓	
CDC Well-Being Scale Brief	10			P	30		
European Social Survey (ESS)	240		✓	I,P	7	✓	
Flourishing Scale	8	15		P	28	✓	
Gallup-Healthways Well-Being Index	42+	15	✓	I	1	✓	✓
Global Assessment Tool (Soldier GAT)	110	20	✓	C	28	✓	✓
Midlife Development in the United States (MIDUS)	>250	90	✓	I,P		✓	
Navy-Marine Corps Quality of Life Questionnaire	103			P,C			✓
NHCS General Well-being Scale	18-33			P	30		
Personal Wellbeing Index – Adult (PWI-A)	8-9	15	✓			✓	
Ryff's Scales of Psychological Well-being	18-120			I			
WHO Quality of Life (WHOQOL-BREF)	26		✓	I,P	14	✓	✓
World Values Survey (WVS)	224		✓	I	1		

* Interview (I); Paper and Pencil (P); Computer (C)

* Blank cells indicate no evidence identified in literature reviewed.

Eight of the population-based measures reviewed supplied normative data, which serve to identify features of the groups being assessed. The availability of normative data is critical to decisions about generalization. That is normative data portray groups based on a compilation of their members' attributes. This allows for comparisons with similar groups or a larger population on performance measures. Only four of these eight were thought to be military relevant (i.e., the Gallup-Healthways Well-Being Index, Soldier GAT, Navy-Marine Corps Quality of Life Questionnaire and WHO-QOL-BREF). There is a wide range in the number of items contained within the measures. The Flourishing Scale has eight and the MIDUS has more than 250 items. Seven of the 13 are relatively short with fewer than 50 items. The time to complete the measures is included for six of them and runs from 10 minutes in the case of the Australian Unity Wellbeing Index to 90 minutes for the MIDUS. The majority of the measures comes in a couple of formats (i.e., interview, and paper and pencil) with the most common being the interview. Eight measures are known to follow standard administration procedures. The time period covered by the measures is one day for the Australian Unity Wellbeing Index, Gallup-Healthways and World Values Survey, and up to 30 days for the CDC Well-Being Scale Brief and NCHS General Well-Being Scale. No information was included for three measures.

Correlates of Measures of Well-being

There are numerous studies using the population-based, well-being measures demonstrating their correlation with events and behaviors. A correlation describes the changes in one variable as it relates to another. Correlations can be positive, as one variable increases so does the second, or negative, as one variable increases the other decreases. Correlations allow prediction but do not demonstrate causation. In this review of 13 population based measures of well-being, correlations were noted to exist between well-being and epidemiological and mental health factors (See Appendix A). The Australian Unity Wellness Index has shown changes in well-being in relation to national events such as threats of war, terror attacks, substantial changes in economic conditions and media campaigns. Other measures such as the World Value Survey have investigated behaviors and found positive correlations between well-being and tolerance as well as gender equity. The Gallup-Healthways, General Well-Being Schedule and MIDUS all demonstrate an increase in health-related behaviors such as care access, care utilization and physical activity with well-being. They likewise found a decrease in other health-related behaviors such as tobacco use, disease and teenage pregnancy with an increase in well-being. The MIDUS, General Well-Being Schedule and the European Social Survey have found negative correlations between well-being and psychological factors such as poor self-esteem and depression. While these measures do demonstrate correlations with events and behaviors, they have not established whether the events or behaviors cause well-being or vice versa.

Discussion and Conclusion

Well-being is a concept which has been modified over the ages. Current researchers, policymakers and caregivers define well-being in varied ways, incorporating an array of human conditions. In its simplest form, well-being is defined as happiness, which is responsive to current conditions and events, and life satisfaction which is reflective of past experiences and is more stable over time.^{12,17} Well-being does not appear to be tied to any single aspect of the human condition. For example, Ryff, et al., observed that elderly people with chronic and terminal health conditions may still report positive well-being.¹⁸ Adm. Mullen has proposed TFF as a model of well-being which may be used to assess force readiness. To this end, a variety of population-based measures of well-being have been reviewed and compared across their alignment to the TFF model, practical components and psychometric components. While most of the 13 measures align with several of the TFF domains, the behavioral, environmental and nutritional domains are underrepresented and deserve more attention in terms of their impact on fitness, readiness and well-being. Further, any measure of well-being utilized to assess force readiness ought to provide normative data in order to allow for comparisons with samples of interest. Reliability information must be made explicit, and it is imperative that a measure of well-

being attend to predictive, concurrent and external validity, in particular. Currently, no single measure aligns perfectly with all eight domains of TFF, has strong psychometric and practical properties as well as demonstrated use with the military. However, the Gallup-Healthways shows promise in that it has been used with the military and has factor-analyzed subscales which align to the majority of the TFF domains, lacking only the social and environmental domains of TFF. Another benefit of the Gallup-Healthways is that additional items may be added and the Gallup Wellbeing Finder, also a Gallup product, does offer social well-being and community well-being subscales which may be utilized.⁴⁸

Appendix A

Background: Population-Based, Well-being Measures

Australian Unity Wellness Index (AUWI)

The AUWI is comprised of the National Wellness Index (NWI), the Personal Wellness Index, and two to three additional questions regarding current topics. The AUWI is administered to 2,000 Australians every six months. The NWI asks respondents how satisfied they are with six aspects of Australian life: the economy, the environment, social conditions, governance, business and national security. Other countries have adapted the NWI for similar use. The NWI correlates with global and component scores of personal well-being. It is also responsive to national events such as threats of war, terror attacks, substantial changes in economic conditions and media campaigns.^{19,20}

Centers for Disease Control (CDC) Well-being Scale Brief

The CDC Well-Being Scale Brief is a 10-item measure of psychological, physical and social components of well-being. These domains are based on the CDC's literature review and consultation with subject matter experts, and are consistent with the World Health Organization's (WHO's) definition of health, which includes "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." This instrument relies on the self-report of functioning over the 30 days prior to administration. It is a paper-and-pencil survey with items designed in Likert fashion.²¹ There is moderate to high positive correlations with factors such as satisfaction with family life, health, housing, job and neighborhood.

European Social Survey (ESS)

The European Social Survey was developed to examine attitudes and beliefs across 30 European countries. The survey includes 240 core items with additional rotating item modules. The core items measure social variables such as media use, social and public trust; political interest, participation and orientation; moral, political and social values; national, ethnic and religious allegiances; well-being; health and security; and socio-economic and demographic variables. The method of administration varies from paper-and-pencil questionnaire to in-person interviews, depending on the culture and customs of each country. Studies published using ESS data show correlations with inclusion and reduced suicide in the elderly, trust and exploitation, and religion and life satisfaction. Formal and informal volunteerism was found not to correlate with social, psychological or cultural factors, and political interest was unrelated to the duration before the next election.^{22,23,24,25,26,27}

Flourishing Scale

The Flourishing Scale is self-report measure of psychological and social functioning. College students (N=689) were used to develop the scale. It consists of eight items pertaining to positive relationships, feelings of competence and a sense of purpose. The items are answered in Likert fashion to produce an overall score. High scores are purported to measure an optimistic view of self. The Flourishing Scale has been demonstrated to correlate with the Ryff Scale and the Basic Need Satisfaction Scale.²⁸

Gallup-Healthways Well-Being Index

The Gallup-Healthways Well-Being Index is a population-based survey which measures both experiential well-being (affective experiences over the last 24 hours) and evaluative well-being (memory of experiences). The survey is conducted through English- and Spanish-language telephone interviews. Each day, 1,000 respondents are polled, allowing for evaluation of daily variation as well as yearly aggregate responses. The telephone survey takes approximately 12 to 15 minutes to complete. The index is comprised of 42 core well-being questions as well as demographic items. Additional items may be added-based-relevant events. The survey measures six well-being domains: life evaluation, emotional health, physical health, healthy behavior, work environment and basic access. Survey data from 2008 indicate that as the well-being index increased so did physical activity, dental visits, life expectancy, school enrollment and household income. Conversely, as the well-being index decreased there were increases in rates of tobacco use, obesity, infant mortality, heart disease, disability, diabetes, teenage pregnancy, poverty, food stamp usage, fatal motor accidents and unemployment.¹⁷

Global Assessment Tool (Soldier GAT)

The Global Assessment Tool (Soldier GAT) is a Defense Department measure designed to assess soldier fitness in four areas: social, emotional, family and spiritual. The tool is currently used to inform computer-generated recommendations for education to address low functioning in any of the four areas. It is also used to provide unit leadership with an overall resiliency profile of their unit. Preliminary validation of the GAT has involved relating scores on this instrument to those of existing Army ratings of post-traumatic stress disorder (PTSD), depression, alcohol abuse and global ratings in the four areas of soldier fitness: social, emotional, family and spiritual. At this time, no other correlates have been identified as being associated with particular scores on the GAT.²⁹

Mid-life Development in the United States (MIDUS)

The MIDUS is a study investigating age-related differences as they pertain to physical health, psychological well-being and social responsibility. The MIDUS was first implemented in 1994 to 1995 and then again in 2004 to 2009. For each participant, the MIDUS uses a phone interview in conjunction with a combination of questionnaires. These instruments are designed to assess factors such as psychological and physical health, beliefs about health, social participation, social networks and support, sexuality, childhood background, spouse and partner information, children and parenting, occupational history, finances, living arrangements, personality traits, well-being, positive and negative affect, sense of control and goal commitments. The instruments also collect demographic information such as marital status, age, race and education. The 2004-to-2009 survey added measures of daily stress, cognitive evaluations, biomarker assessments and neuroscience assessments. The MIDUS study has investigated correlations among variables such as marital status, family structure, socioeconomic standing, social participation, social support, employment status, health status, health care utilization with psychological factors.³⁰

Navy-Marine Corps Quality of Life Questionnaire

The Navy-Marine Corps Quality of Life Questionnaire is an adaptation of the Navy Quality of Life Survey which was developed in 1999 to assess the impact of quality of life upon retention in the service. The questionnaire measures background, global quality of life, and cognitive and affective aspects of a variety of life domains and their outcomes. The global quality-of-life section measures satisfaction with life via two previously developed surveys: Life Characteristics Scale and Life Satisfaction Scale. The life domains include 12 subsections which measure residence, neighborhood, leisure and recreation, health, friends and friendships, marriage and intimate relationship, relationship with children, relationship with relatives, standard of living/income, professional development/job, personal development and shipboard life. In 2002, the questionnaire was adapted to include career development, sailor preparedness and spiritual well-being items. The Marine Corps

adapted the Navy Quality of Life Survey in 2002, adding an organizational commitment domain. The Navy-Marine Corps Quality of Life Questionnaire has been administered in person, via the mail and in 2002 as a web-based survey.^{31,32,33}

National Center for Health Statistics (NCHS) General Well-Being Schedule (GWB)

The NCHS GWB was developed in 1970 for the NCHS and was used as part of a national health examination of 6,931 adults from April 1971 through October 1975. The GWB intends to assess psychological and behavioral aspects of subjective well-being and distress. It is a self-report, paper-and-pencil instrument that is comprised of 33 items. Respondents answer primarily in a Likert fashion as to how they have felt for the past month for most items and for the past year for others. The GWB has six subscales to include health worry, energy level, satisfying-interesting life, depressed-cheerful mood, emotional-behavioral control and relaxed versus tense-anxious. One study using the GWB found that in a sample of African-American women, those who had greater body mass, higher alcohol and cigarette use, and depression, had lower psychological well-being measurements on the GWB. Women who were more physically active and who had reported self-esteem had higher well-being measurements on the GWB.^{34,35}

Personal Wellbeing Index – Adult (PWI-A)

The PWI-A was developed in Australia to measure quality-of-life issues that address success and positive aspects of participants' lives. The PWI-A adds subjective perceptions of well-being to the traditional objective measures of health, wealth and social functioning. The PWI-A asks questions about standard of living, health, achieving in life, relationships, safety, community-connectedness, future security, and spirituality and religion. The PWI-A advantages include development for two decades, availability in multiple languages and versions available for pre-school children, school children and adults. There is also an intellectual and cognitive disability version. The index is an eight-item, verbal or written, self-administered test with no defined time limit.³⁶

Ryff's Scales of Psychological Well-being

The Ryff's Scale was developed to measure well-being in geriatric patients who typically exhibit chronic psychological health conditions and would report low well-being using traditional measures. The domains in the Ryff's Scales include self-acceptance, environmental mastery, positive relations, purpose in life, personal growth and autonomy. This instrument is available in versions ranging from 18 to 120 items and is administered by interview. The self acceptance, environmental mastery and purpose in life domains correlate with other existing measures of well-being, while personal growth, positive relations and autonomy domains measure new constructs.^{37,38}

WHO Quality of Life Indicator – Brief Version (WHOQOL-BREF)

The WHOQOL-BREF is a shortened version (26 items) of the WHOQOL-100. It assesses (via a five-point Likert scale) the individual's view of their well being in 24 particular facets of quality of life (e.g., positive feeling, social support, financial resources) as well as overall health. The WHOQOL-BREF measures four domains: physical health, psychological, social relationships and environment. It has 24 items with only one question per facet. The WHOQOL-BREF was developed from surveys in 23 countries with data from 11,830 individuals. The four domain scores from the WHOQOL-BREF have been shown to correlate with those from the longer version as well as other quality of life scales, measures of health-illness, age, depression and disability.^{39,40,41}

World Values Survey (WVS)

The WVS was developed in an effort to examine the values and norms of inhabitants of over 50 nations representing approximately 90 percent of the world's population. The survey was conducted in five phases covering the time period from 1981-2007. Participants were primarily interviewed in a face-to-face fashion, although phone calls were made to participants in remote areas. The WVS is composed of 245 items that gauge participants' views on topics such as the economy, financial resources, work, politics, religion, marriage, family, morality, social issues and the impact of technology on society. Demographic information and participants perceived interest levels in the survey are documented as well. More than 1,000 publications are based on the data from this longitudinal study. WVS data indicate aggregate subjective well-being (i.e., happiness and satisfaction with life) and correlates with freedom of choice in matters related to economic growth, democratization and social tolerance. Specifically, the WVS data show subjective well-being correlates with higher levels of gender equity, and tolerance for those with alternative lifestyles and neighbors of different races and ethnic backgrounds.^{42,43,44}

Appendix B

Subscale Alignment with TFF Domains

Measure	Psychological	Social	Behavioral	Spiritual	Physical	Medical	Nutritional	Environmental
Australian Unity Wellbeing Index		National Well-being; Personal Life Satisfaction						
CDC Well-Being Scale Brief	Positive affect; Negative affect			Satisfaction with life; Meaning in life	Physical health			
Gallup-Healthways Well-being Index	Emotional health		Healthy behavior	Life evaluation	Physical health	Physical health; Basic access	Basic access	
Solider Global Assessment Tool	Emotional	Social; Family		Spiritual				
Navy-Marine Corps Quality of Life Questionnaire		Interpersonal relationships		Spiritual well-being				
NCHS General Well-Being Schedule			Emotional-behavioral control	Satisfying-interesting life;	Energy level			
Ryff's Scales of Psych Well-Being	Self-acceptance; Personal growth	Positive relations		Purpose in life				Environmental mastery
WHOQOL-BREF	Psychology	Social relations			Physical health			Environment

Appendix C

Well-being Measures, Subscales and Sample Items

Measure	Subscale	Description of Subscale	Sample Item
Australian Unity Wellbeing Index	Personal Well-being	Rates satisfaction with aspects of personal life	“How satisfied are you with your health (personal relationships, achievements, etc)”
	National Well-being	Rates satisfaction with national life	“How satisfied are you with life in Australia (or U.S.) (economic situation, social conditions, etc.)”
CDC Well-Being Scale Brief	Satisfaction with life	Rates respondents’ sense of contentment	“I am satisfied with my life”
	Meaning in life	Speaks to respondents realizing and being comfortable with what their lives are all about	“My life has a clear sense of purpose”
	Competence	Respondents indicate how successful they feel	“Most days I feel a sense of accomplishment from what I do”
	Positive affect	Respondents tell how happy they are	“Cheerful”
	Negative affect	Respondents acknowledge their degree of despair	“Hopeless”
	Social health	Measures respondents’ satisfaction with their support system	“Your friends and social life”
	Physical health	Respondents report how fit and vigorous they feel	“In general, would you say your health is ...”
Gallup-Healthways Well-being Index	Emotional health	A rating reflecting experiences from the previous day, including stress, affect, learning or interest, being treated with respect and the diagnosis of depression	“Smiling or laughter”
	Physical health	A rating which combines daily health and history of disease	“Health problems that get in the way of normal activities”

	Basic access	A rating that measures respondents access to healthcare, safe and satisfying place to live, food, shelter	“Enough money for healthcare”
	Healthy behavior	A rating of lifestyle habits which are related to health outcomes	“Do you smoke?”
Soldier Global Assessment Tool	Emotional	Reflects the presence of positive mood, satisfaction with life optimism, freedom from depression, strengths and personal resilience	“How well does this statement describe you: I control my emotions by changing how I think about things?”
	Social	Measures the level of trust in soldiers and leaders, how one feels about the Army and one’s unit, and overall morale	“How often to you feel close to people?”
	Family	Looks at the status of personal and family relationships	“How satisfied are you with your marriage/ relationship?”
	Spiritual	Measures whether one has a sense of meaning, accomplishment and purpose beyond oneself	“Answer in terms of whether the statement describes how you actually live your life: My life has a lasting meaning.”
Navy-Marine Corps Quality of Life Questionnaire	Relationships	Measures the impact and quality of relationships including those with relatives, marriage/intimate, children and friends	“How satisfied are you with the following aspects of your relationship with your children? The amount of time you have with your children?”
	Spiritual well-being	Measures the importance and impact of spirituality in the respondents’ life	“How much to you AGREE or DISAGREE with the following statements: My life has purpose and meaning?”
	Personal health	Measures access to care and perceived personal physical health	“How satisfied are you with the following aspects of your health and health care? Your current weight? Your level of energy? How well you sleep? The amount of sleep you get...?”
	Freedom from health concern, worry, distress	Respondents rate the degree to which they have been contemplating health matters and distressed by specific health	“Have you been bothered by any illness, bodily disorder, pains or fears about your health? (DURING THE PAST

NCHS General Well-Being Schedule		issues	MONTH"
	Energy level	Assesses respondents' general energy level and upon awakening	"Have you been waking up fresh and rested? (DURING THE PAST MONTH)"
	Satisfying, interesting life	Respondents report how much they find their lives to be appealing	"How happy, satisfied or pleased have you been with your personal life? (DURING THE PAST MONTH)"
	Cheerful vs. depressed mood	Captures how respondents have been feeling generally in terms of mood as well as the extent to which they have felt upbeat or down	"How DEPRESSED or CHEERFUL have you been? (DURING THE PAST MONTH)"
	Relaxed vs. tense, anxious	Addresses overall feelings of relaxation and tension, and more specifically, the degree to which respondents feel overwhelmed, on edge, and troubled	"Have you been under or felt you were under any strain, stress, or pressure? (DURING THE PAST MONTH)"
	Emotional-behavioral control	Screens for respondents' opinions of how well they have managed their affective states and related behaviors	"Have you been in firm control of your behavior, thoughts, emotions OR feelings? (DURING THE PAST MONTH)"
Ryff's Scales of Psych Well-Being	Environmental mastery	Measures the extent to which individuals feel in control of and able to act in the environment	"In general, I feel I am in charge of the situation in which I live."
	Personal growth	Assesses the respondents' sense of continued development and self-improvement	"I have a sense that I have developed a lot as a person over time."
	Positive relations with others	Respondents' reports of satisfying, trusting relationships with other people	"Most people see me as loving and affectionate."
	Purpose in life	Measures the extent to which respondents' hold beliefs that give life meaning	"I enjoy making plans for the future and working to make them a reality."
	Self-Acceptance	Measures respondents' positive attitude about themselves	"When I look at the story of my life, I am pleased with how things have turned out."
		A measure of physical health	"How much do you need any

WHOQOL-BREF	Physical health	including pain, energy, sleep, dependence on medication, mobility, and activities of daily living	medical treatment to function in your daily life?"
	Psychological	Respondents rate feelings, self-esteem, thinking, learning, memory and concentration, body image, spirituality, religion and personal beliefs	"To what extent do you feel your life to be meaningful?"
	Social relationships	Assesses personal relations, sexual relations and practical social support	"Do you get the support from others you might need?"
	Environment	Respondents rate financial resources, leisure, home environment, access to health and social care, physical safety and transportation	"How safe do you feel in your daily life?"

Appendix D Reliability Statistics

Measure	Test Retest	Internal Consistency
CDC Well-Being Scale Brief ²¹	NIA	Cronbach Alpha = .87
European Social Survey (ESS) ⁴⁵	N/A	Cronbach Alpha by Country Range = 0.39 to 0.99
Flourishing Scale ²⁸	r = 0.71	Cronbach Alpha = .87
Gallup-Healthways Well-being Index ¹⁷	NIA	Cronbach Alpha = 0.79 Domain Composite for standardized items by state Cronbach Alpha by Domain Range is 0.73 to 0.91 For standardized items by state
Global Assessment Tool ²⁹	NIA	Cronbach Alpha > 0.80 All domains and subdomains
NCHS General Well-Being Schedule ^{34,35,46,47}	r = 0.851	Cronbach Alpha = 0.912 (male) Cronbach Alpha = 0.945 (female)
	NIA	Cronbach Alpha = 0.92
	NIA	Cronbach Alpha = 0.89
	NIA	Cronbach Alpha = 0.94
Mid-life Development Survey (MIDUS) ³⁰	NIA	Combine Well-being scale: 1995 Cronbach Alpha = 0.81 2005 Scale Cronbach Alpha = 0.84
Personal Wellbeing –Index (PWI-A) ³⁶	r = 0.84	No statistic reported
Ryff’s Scales of Psychological Well-Being ^{36,37,38}	0.81 [PG and EM] to 0.88 [AU]	Cronbach Alpha 120 item version 0.86 (AU) to 0.93 (SA) 18 item version 0.33 (PL) to 0.56 (PR)
World Health Organization-Quality of Life-BREF ^{39,40}	Range of 4 domains = 0.66 - 0.87	Cronbach Alpha by Domain Scores Range = 0.66-0.84

*Values provided where appropriate and available

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